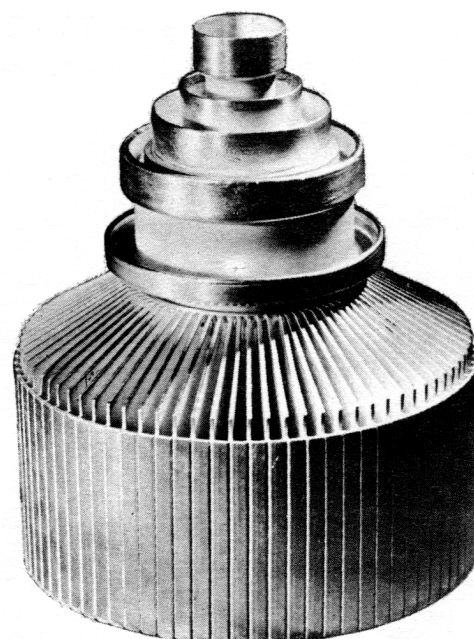


TH 293 TETRODE

The TH 293 is a forced air cooled ceramic metal tetrode, of coaxial structure. It can be used as a C.W. oscillator or a grounded grid R. F. power amplifier at frequencies up to 1000 MHz. The anode is capable to dissipate 4.5 kW.

TH 293 tetrode is specially well adapted as R. F. power amplifier in broadband television transmitter and in S. S. B. or F. M. services. Due to its linear characteristics TH 293 is also designed for linear amplifier television translator handling both sound and vision signals in a single channel with a crossmodulation level better than 52 dB.



GENERAL CHARACTERISTICS

Electrical

Type of cathode	thoriated tungsten	
Heating	direct	
Heater voltage (1) (2)	5 + 2%	V
Heater current, approx.	47	A
Peak cathode current	9	A
Interelectrode capacitance		
- input (g2 tied to g1)	32	pF
- output (g2 tied to g1)	7.5	pF
- cathode-anode	0.03	pF
Amplification factor g1-g2 avg. ..	7	
Transconductance	30 000	μmhos

Mechanical

Mounting position	vertical	
Anode cooling	forced air	
Minimum airflow (3)	5	m ³ /mn
Corresponding pressure drop	5	millibar
Maximum inlet air temperature ..	45	°C
Maximum outlet air temperature ..	100	°C
Maximum temperature (4)	250	°C
Dimensions	see drawing	

- (1) - For heater voltage application, see note page 4 .
- (2) - In high frequency operation, the cathode is subjected to considerable back bombardment, which raises its temperature. After the circuit has been adjusted for proper tube operation, the heater voltage must be reduced to prevent over-heating of the cathode with resulting short life.
- (3) - 30°C incoming air temperature 4.5 kW anode dissipation.
- (4) - At any point of ceramic insulators.
It is necessary to provide air cooling for tube terminals and insulators. This air flow must be established before application of any electrode voltage and maintained during 3 minutes at least after heater voltage has been removed.



CLASS B NARROW BAND F.M. SERVICE-R.F. POWER AMPLIFIER

Grounded grid conditions

Maximum ratings

All potentials referred to cathode potential

D. C. anode voltage	5	kV	Anode dissipation	4.5	kW
D. C. grid g2 voltage	400	V	Grid g2 dissipation	25	W
D. C. grid g1 voltage	-250	V	Grid g1 dissipation	15	W
Peak cathode current	9	A	Frequency	1000	MHz
D. C. anode current	2.5	A			

Typical operation

D. C. anode voltage	4.5	kV	D. C. anode current	1.15	A
D. C. grid g2 voltage	300	V	Driving power	200	W
D. C. grid g1 voltage	-80	V	Anode dissipation	2.5	kW
Peak R. F. driving voltage	100	V	Load output power (1)	2.5	kW

(1) - With a 85% circuit efficiency

LINEAR AMPLIFIER

SINGLE SIDE BAND SUPPRESSED - CARRIER SERVICE

TWO TONE MODULATION

Maximum ratings

All potentials referred to cathode potential

D. C. anode voltage	6	kV	Anode dissipation	4.5	kW
D. C. grid g2 voltage	800	V	Grid g2 dissipation	25	W
D. C. grid g1 voltage	-250	V	Frequency	1000	MHz
Average anode current at peak of envelope	2.5	A			

Typical operation

Class AB₁ - Two tone modulation

D. C. anode voltage	5.7	kV	Average grid g2 current at peak of envelope	45	mA
D. C. grid g2 voltage	700	V	Average grid g2 current	30	mA
D. C. grid g1 voltage	-80	V	Load impedance	1800	Ω
Zero signal anode current	0.5	A	Circuit efficiency	90	%
Average anode current at peak of envelope	1.6	A	Average load power	2	kW
Average anode current	1.15	A	Load peak envelope power	4	kW



CLASS A - LINEAR AMPLIFIER FOR T.V. TRANSLATOR

HANDLING BOTH SOUND AND VISION SIGNALS
 IN A SINGLE CHANNEL-C.C.I.R. SPECIFICATIONS

Maximum ratings

All potentials referred to cathode potential

D.C. anode voltage	5	kV	D.C. anode current	2	A
D.C. grid g2 voltage	650	V	Anode dissipation	4,5	kW
D.C. grid g1 voltage	-250	V	Grid g2 dissipation	25	W
Peak cathode current	6	A	Frequency	1000	MHz

Typical operation

Frequency	780	MHz	D.C. anode current	1	A
Heater voltage	4.7	V	Gain	13	dB
D.C. anode voltage	3.5	kV	Video power	400	W
D.C. grid g2 voltage	550	V	Crossmodulation level (3 tones		
D.C. grid g1 voltage	-45	V	test)	≤ 52	dB *

* - under video level

TUBE PROTECTION AND FEEDING INSTRUCTIONS

In order to achieve long tube life, maximum operating efficiency and circuit stability consistent with the full tube capability, the following instructions should be strictly observed.

I - ELECTRODES FEEDING ORDER - Apply successively :

1. - $\frac{1}{2}$ Vf (filament voltage) during 60 seconds
2. - Nominal Vf during 60 seconds
3. - Grid bias
4. - Anode voltage
5. - Screen voltage
6. - Driving voltage

II - SECURITY DEVICES AGAINST ANODE, SCREEN, GRID OVERCURRENTS -

1. - Overcurrents due to improper utilisation conditions : the protection can be achieved by 3 relays in series, respectively in grid, screen, and anode circuits. These relays are adjusted so as to operate when a current equal to 1.5 Imax. is attained, Imax. being the normal current used in the considered operating conditions. When one of these relays operate, the driving voltage and the screen and anode voltages are simultaneously cut-off.

2. - Overcurrent due to stray oscillations or electrode arcings : the protection can be made by the use of 3 rapid cut-off security devices (grid, screen, anode), acting for a current equal to 5 Imax., Imax being the normal current used in the considered operating conditions. Each of these 3 systems acting on the 2 others should short-circuit driving, screen and anode voltages and eventually grid bias voltage with a total delay lower than 30 microseconds.

III - MONITORING DEVICE FOR OVERTEMPERATURE OF OUTLET COOLING AIR :

The temperature of outlet air coming from the anode cavity must not exceed 100°C. The temperature rises when the cavity is not properly adjusted and it is necessary to provide a monitoring device so as to prevent the user from improper adjustment. On the other hand, this device allows the user to be sure that the air evacuation system (generally made by the user) is well adapted to the equipment.



CLASS B NARROW BAND F.M. SERVICE-R.F. POWER AMPLIFIER

Grounded grid conditions

Maximum ratings

All potentials referred to cathode potential

D. C. anode voltage	5	kV	Anode dissipation	4.5	kW
D. C. grid g2 voltage	400	V	Grid g2 dissipation	25	W
D. C. grid g1 voltage	-250	V	Grid g1 dissipation	15	W
Peak cathode current	9	A	Frequency	1000	MHz
D. C. anode current	2.5	A			

Typical operation

D. C. anode voltage	4.5	kV	D. C. anode current	1.15	A
D. C. grid g2 voltage	300	V	Driving power	200	W
D. C. grid g1 voltage	-80	V	Anode dissipation	2.5	kW
Peak R. F. driving voltage	100	V	Load output power (1)	2.5	kW

(1) - With a 85% circuit efficiency

LINEAR AMPLIFIER

SINGLE SIDE BAND SUPPRESSED - CARRIER SERVICE

TWO TONE MODULATION

Maximum ratings

All potentials referred to cathode potential

D. C. anode voltage	6	kV	Anode dissipation	4.5	kW
D. C. grid g2 voltage	800	V	Grid g2 dissipation	25	W
D. C. grid g1 voltage	-250	V	Frequency	1000	MHz
Average anode current at peak of envelope	2.5	A			

Typical operation

Class AB₁ - Two tone modulation

D. C. anode voltage	5.7	kV	Average grid g2 current at peak of envelope	45	mA
D. C. grid g2 voltage	700	V	Average grid g2 current	30	mA
D. C. grid g1 voltage	-80	V	Load impedance	1800	Ω
Zero signal anode current	0.5	A	Circuit efficiency	90	%
Average anode current at peak of envelope	1.6	A	Average load power	2	kW
Average anode current	1.15	A	Load peak envelope power	4	kW



CONSTANT CURRENT CHARACTERISTICS

